BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of an Investigation of Missouri Jurisdictional Generator Self-Commitments Into SPP and MISO Day-Ahead Markets.	)))	File No. EW-2019-0370

AMEREN MISSOURI'S RESPONSE TO ORDER OPENING AN INVESTIGATION OF MISSOURI JURISDICTIONAL GENERATOR SELF-COMMITMENTS AND SELF SCHEDULING AND TO ORDER DIRECTING COMMENTS

COMES NOW Union Electric Company d/b/a Ameren Missouri ("Company" or "Ameren Missouri") and in response to the above-captioned Missouri Public Service Commission ("Commission") orders (the "*Order Opening Investigation"* and "*Order Directing Comments"*), respectfully states as follows:

I. *Order Opening Investigation*

1. Ordering paragraph 2 of the *Order Opening Investigation* directs Missouri investor-owned electric utilities to provide six categories of information set forth in that Order. Ameren Missouri is providing that information as part of this response. To aid in the Commission's review, Ameren Missouri provides the following information respecting both self-commitment and self-scheduling in the MISO[1] day-ahead market. In reviewing the information the Company is providing, it is important that the Commission understand these terms, the operating considerations that must go into managing a utility's generating units, and, in particular, that the Commission understand the difference between unit commitment and unit dispatch.

[1] Midcontinent Independent System Operator, Inc.

A. Key Definitions.

2. Unit *commitment* is the decision to bring a unit online (or to subsequently take the unit off-line (i.e., to decommit it)). In contrast, unit *dispatch* establishes the level of output for a unit once it has been committed.

3. There are five commitment status designations in the MISO market, as follows: (i) economic, (ii) must-run (a/k/a, self-commit), (iii) outage, (iv) emergency, and (v) not participating. Similarly, there are five dispatch status designations in the MISO market, as follows: (i) economic, (ii) self-schedule, (iii) emergency, (iv) not qualified (this status only applies to ancillary services), and (v) not participating.

4. A must run (self-commit) commit status designates that the market participant itself is committing the resource at its unit minimum. However, its dispatch above its unit minimum is determined by MISO, based on price. An economic commit status means that it is MISO that determines whether to commit the unit. Stated otherwise, when the market participant designates a unit as must run, it is informing MISO that the unit will be on-line at its unit minimum irrespective of the results of any margin calculation MISO's day-ahead model performs. In contrast, when the market participant designates the unit as in economic status, MISO will commit (issue a start order or leave on-line) the unit when MISO's day-ahead model forecasts that market revenues will exceed the as-offered costs. In the economic status case, MISO would de-commit the unit (issue a stop order) when the opposite occurs.

5. Turning to self-scheduling, once a unit is committed, if the unit has also been designated to be in a self-schedule dispatch status, it is the market participant that is establishing the level at which an on-line (committed) unit will be dispatched, regardless of the day-ahead price. As noted earlier, if the unit is in economic dispatch status, it is the MISO model that will determine the dispatch level based on price. It is important to note here that the mere act of

assigning a must run (self-commit) status to a unit does not in and of itself mean the unit is self-scheduled. In fact, as discussed in more detail below, while Ameren Missouri must runs (self-commits) several of its generation units, but with only very limited exceptions, it does not self-schedule its units' dispatch. As such, most of the discussion in this response focuses on the use of the must run commitment status.

B. <u>Ameren Missouri's Operations.</u>

6. In general, Ameren Missouri utilizes a must run commit status for those units whose operating characteristics, such as high cost to restart, expected increase in forced outages if the units are not placed in must run commit status, and maintenance and capital costs due to unit cycling (again, if not placed in must run commit status), warrant such a designation. These units include all of Ameren Missouri's coal-fired units (other than those at the Meramec Energy Center) and the Callaway Nuclear Energy Center. Must run commit status is also utilized for Osage and Keokuk Energy Centers to ensure compliance with permit requirements regarding minimum flows. Must run commit status may also be used for other units not mentioned above when such a unit is scheduled for testing to ensure that the unit will be in operation for the test. Additionally, that status may be used for non-base load units in instances where the margin on the first day alone would not warrant committing the unit (due to its start-up cost) but where the expected margin over a longer period of time justifies committing the unit. Finally, a nuclear unit cannot be cycled and must remain online due to its unique operating requirements and consequently, Ameren Missouri designates it as a must run unit.[2] This is likely a key reason why there is more self-commitment in the MISO market than there is in the Southwest Power Pool

[2] Please note that Maryland Heights Energy Center (landfill gas) and O'Fallon Energy Center (solar) are registered as behind the meter generation resources and as such do not have a commit status in the MISO market. Please also note that Maryland Heights is effectively and operationally a must run unit because of its continuous landfill gas purchase requirements.

("SPP") market since there is significantly more nuclear generation in the MISO market than there is in SPP.

7. Regarding self-scheduling as noted earlier, Ameren Missouri does not generally use the self-scheduled dispatch status for energy. Rather, Ameren Missouri offers its units into the market with an economic dispatch status, thus allowing the operation of the MISO market to establish the level at which the unit is dispatched (for units that have been self-committed, that level will be at or above the unit minimum). MISO's dispatch will depend on its model's comparison of the as-offered unit cost for energy to the locational marginal price ("LMP") for the next dispatch segment. The as-offered costs are based on incremental cost, including fuel, associated transportation expense, an estimate of variable operations and maintenance ("O&M") costs, and emissions allowances. In the case of renewable energy resources, the as-offered cost will also account for foregone production tax credits and in the case of storage resources, the cost to replenish the resource is considered.

8. In making its commit status decisions, the Company's guiding principle is to clear (i.e., sell energy from) its units in the market when doing so benefits customers. Determining this benefit, however, is much more complex than simply comparing as-offered production costs to the prevailing market prices. In addition, the algorithm employed by MISO's model in its day-ahead market to commit units does not adequately account for certain factors that must be accounted for in order to determine what commit status is beneficial.

9. The MISO algorithm used in its day-ahead market has certain limitations in this regard which arise from the fact that the MISO day-ahead market only analyzes the 24-hour period of the next calendar day.[3]

[3] MISO Business Practices Manual ("BPM") 002, Energy and Operating Reserve Markets.

10. Regarding these limitations, it is important to understand that given the relative low cost of Ameren Missouri's baseload and hydroelectric units, those units clear in the MISO's day-ahead market most days of the year, and this would be true regardless of whether they are offered with a must run or economic commit status. However, there are days when a given unit would not clear in the MISO day-ahead market if offered as economic because the modeled margin between the LMP revenue and the as-offered cost for that unit is negative for that specific 24-hour period. However, making a unit commitment status decision merely by looking at one 24-hour period is not appropriate and would harm customers. This is because the market participant must look past the next 24 hours and assess whether this one-day revenue shortfall is projected to persist for a prolonged period of time such that the cumulative shortfalls would exceed the total of the expected foregone margins, the cost to restart the unit and the risk of significant maintenance and capital expenses arising from cycling the unit if it is committed and then decommitted and then committed again. The market participant must also account for unit downtime minimums which means that if a unit downtime minimum is for more than one day, de-committing the unit based only on the next day's MISO model results could mean that the unit will forego margins for the following days when it remains shut-down.

11. To illustrate the limitation of the MISO day-ahead model's 24-hour look ahead period, consider the operating and cost constraints of a Labadie Energy Center unit. These units each have a startup cost in excess of $70,000. If these units were to be offered as economic, they would be de-committed by MISO whenever the total market revenue for the next operating day was less than the as-offered cost for energy – regardless of market price projections for the remainder of the week, the cost to restart the unit, or cycling-related maintenance and capital costs. The unit would then only be committed by MISO if its margin is above the as-offered cost for energy and is enough to also cover the cost to restart the unit. Those restart costs are a

significant hurdle to overcome and they were simply not considered by MISO's modeling when the model would decide to de-commit the unit, if the unit is in economic commit statute. Putting dollars to the illustration, assume that the unit is offered on the last day of a month and that the MISO model predicts a revenue shortfall on the first day of the next month of $1,000. Assume further, however, that for the remaining 29 days (assuming a 30-day month) of that month the actual revenues would exceed costs by $20,000 per day if the unit were to remain on-line. If the unit is offered as economic, MISO would de-commit the unit for the first day of the month and it would remain unavailable until the fourth day of the month due to the minimum down time. After that, the model would also keep it off-line because the potential daily margin of $20,000 would not cover the cost to start the unit. In this illustration, the unit would have foregone a total benefit to customers (and reflected in Ameren Missouri's fuel adjustment clause) of almost $600,000 if it had been in a must run status,[4] but instead it received nothing, as it was offered as economic and never ran during the month.

12. Another consequence of the model's limited forward period for analysis is that market participants do not have a clear means of informing MISO of what the cost to shut down a unit is expected to be (such costs include the cost to restart the unit, foregone expected positive margins during minimum down times, and increases in maintenance and capital costs related to unit cycling (i.e., committing/de-committing/committing again).[5] As the Commission is likely aware, Ameren Missouri's coal-fired units are primarily designed for base load (continuous) operation. However, cycling them on a frequent basis decreases unit availability, and shortens component life expectancies resulting in increased maintenance and capital costs. Each time a power plant is cycled, its major and minor auxiliary components experience significant thermal

[4] $20,000/day x 30 days; minus $1,000 for 1 day.
[5] Similarly, a simple comparison of production costs to prevailing market prices fails to account for the costs to restart cycled units and increases in maintenance and capital costs related to unit cycling.

and pressure stresses, which cause damage. This is most concerning for equipment that is subjected to high temperatures and pressures, and other mechanical forces. Over time and repeated cycles, this can result in failure of critical components. Under a frequent cycling dispatch model, component life can be expected to be shortened. In addition, frequent cycling can be expected to result in more forced outages than would otherwise be the case; which reduces the margins that the unit can produce and increases net energy costs for customer

13. The impact on maintenance and capital costs resulting from increased forced outages, component failure, and shortened component life is significant. This is in addition to foregone market margins when units are out of service. Increased cycling is reasonably expected to result in increased turbine fouling which is a leading cause of unit derates. Correcting this condition can cost several million dollars during a two to three-month long outage period. The number of tube leaks experienced by a unit which is cycled frequently would also be expected to increase. As a conservative estimate, a tube leak outage can cost as much as $50,000 per day in repair costs. A shortening of the inspection intervals for generator field windings to approximately every five (5) years versus the current approximately ten (10) years is yet another expected result of frequent cycling. This is significant, since generator inspections can cost more than $1,000,000 and take over four weeks to perform. Components which are more vulnerable to damage as a result of more frequent cycling (e.g., condensers and feedwater heaters from thermal stresses or air heaters and precipitators from corrosion as air temperatures fall below the dew point when shut down) would be expected to fail or otherwise require service at more frequent intervals.

C. <u>Data Submission.</u>

14. As noted, included with this response is the information requested by each of the six directives contained in the Commission's *Order Opening Investigation*.

II. ***Order Directing Comments***

15. The lettering and numbering for the remainder of this Response corresponds to the ordering paragraphs in the *Order Directing Comments*.

1.a. *Please describe in detail reasons or scenarios that a utility may self-commit instead of bidding into a given market.*

As noted in the Company's above-response to the *Order Opening Investigation,* Ameren Missouri utilizes a must run commit status for:

a) Those units whose operating characteristics, high cost to restart, expected increase in forced outages if the units are not placed in must run commit status, and maintenance and capital costs due to unit cycling (again, if not placed in must run commit status) warrant such a designation. These units include Ameren Missouri's coal-fired units (other than those at the Meramec Energy Center) and the Callaway nuclear energy center.
b) Osage and Keokuk Energy Centers to ensure compliance with permit requirements regarding minimum flows.
c) Units for testing to ensure that the unit will be in operation for the test.
d) Non-base load units in instances where the margin on the first day alone would not warrant committing the unit (due to its start-up cost) but where the expected margin over a longer period of time justifies committing the unit.
e) Nuclear units cannot be cycled and must remain online due to unique operating requirements.

1.b. *Please provide the economic impact of the aforementioned scenarios, or indicate that the information is not available.*

As indicated in the Company's above-response to the *Order Opening Investigation*, units are must run in large part to mitigate the various risks associated with frequent cycling of units – particularly those which were designed as baseload units. These risks include, but are not limited to, increased forced outages, component failure, and shortened component life. It is not possible to know what the above-referenced expenses would have been, but for Ameren Missouri's utilization of the must run commitment status, or in the case of the non-coal baseload units, what the margin would have been but for that status.

Notwithstanding the fact that it is not possible to provide a quantification of what would have happened had the units not been committed using the must run status, please reference the data which is summarized on Exhibit A to this Response.

WHEREFORE, Ameren Missouri hereby submits its Response to the *Order Opening Investigation* and *Order Directing Comments.*

Respectfully submitted,

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ATTORNEYS FOR UNION ELECTRIC COMPANY D/B/A AMEREN MISSOURI

EXHIBIT A[6]

a) *The difference between production costs and corresponding prevailing market prices for that amount of energy which was must run for Labadie, Rush Island and Sioux:*

	Prevailing Market Price (LMP) less Offered Production Cost
Jun 16 - May 17	$ 259,286,659
Jun 17 - May 18	$ 242,253,498
Jun 18 - May 19	$ 298,255,654
Total	$ 799,795,811

b) *The difference between production costs and corresponding prevailing market prices for that amount of energy which was must run for Osage and Keokuk:*

	LMP-Offered Production Cost
Jun 16 - May 17	$ 26,827,741
Jun 17 - May 18	$ 32,333,696
Jun 18 - May 19	$ 28,641,786
Total	$ 87,803,223

[6] The dollar figures listed in this Exhibit do not include the sums associated with the amount of energy that was economically cleared by MISO above unit minimums during the periods when the unit was run. All figures on this Exhibit A are from Tab 4-6 MR SS of the data submitted in response to the *Order Directing Investigation.*

c) *The difference between production costs and corresponding prevailing market prices for that amount of energy which was must run for Taum Sauk and the Company's CTG's.*

		LMP-Offered Production Cost
Jun 16 - May 17	$	(16,149)
Jun 17 - May 18	$	55,543
Jun 18 - May 19	$	45,608
Total	$	85,002

d) *The difference between production costs and corresponding prevailing market prices for that amount of energy which was must run for Meramec:*

		LMP-Offered Production Costs
Jun 16 - May 17	$	5,818,698
Jun 17 - May 18	$	5,611,941
Jun 18 - May 19	$	5,443,130
Total	$	16,873,769

e) *The difference between production costs and corresponding prevailing market prices for that amount of energy which was must run for Callaway:*

		LMP-Offered Production Costs
Jun 16 - May 17	$	133,536,821
Jun 17 - May 18	$	117,412,154
Jun 18 - May 19	$	142,886,689
Total	$	393,835,664